



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

09/939,767

08/28/2001

Shunpei Yamazaki

740756-2358

3748

31780

7590

02/08/2005

ERIC ROBINSON

PMB 955

21010 SOUTHBANK ST.

POTOMAC FALLS, VA 20165

EXAMINER

HOGANS, DAVID L

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 02/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

HA

Office Action Summary

Application No.

09/939,767

Applicant(s)

YAMAZAKI, SHUNPEI

Examiner

David L. Hogans

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 November 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,5,7,35,36,38-43,45-48,50-61,74 and 75 is/are pending in the application.
- 4a) Of the above claim(s) 62-73 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,5,7,35,36,38-43,45-48,50-61,74 and 75 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 09/094,345.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
 Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
 Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

This Office Action is in response to the Request for Continued Examination filed on November 12, 2004.

Status of Claims

Claims 1, 2, 5, 7, 35, 36, 38-43, 45-48 and 50-61 are pending. Claims 74 and 75 are newly added. Claims 62-73 are withdrawn. Claims 3, 4, 6, 8-34, 37, 44 and 49 are cancelled.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 54-61 are rejected under 35 U.S.C. 102(e) as being anticipated by 5,946,560 to Uochi et al.

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

In reference to Claims 54 and 58, Uochi et al. teaches:

- an active layer comprising a semiconductor film comprising silicon (12 or 23);
(See Figures 1 and 2 and columns 3-6 lines 60-60)
- a gate electrode (15 or 25) comprising tantalum adjacent to said active layer with a gate insulating film (14 or 24) interposed between; (See Figures 1 and 2 and columns 3-6 lines 60-60)
- wherein a source region and a drain region (16, 18, 26, 28) formed in said active layer comprise a nickel phosphide (See Figures 1 and 2 and columns 3-6 lines 60-60);
- a first interlayer insulating film over said active layer and on said gate electrode (See Figures 1 and 2 and columns 3-6 lines 60-60);
- a second interlayer insulating film over said first interlayer insulating film (See Figures 1 and 2 and columns 3-6 lines 60-60)

The Examiner notes that the nickel phosphide is formed during the anneal step of Uochi et al.

In reference to Claims 55 and 59, Uochi et al. teaches:

- wherein said nickel phosphide is one of NiP, NiP₂ and Ni₂P (See Figures 1 and 2 and columns 3-6 lines 60-60)

The Examiner notes that NiP, NiP₂ or Ni₂P is formed during the anneal step of Uochi et al.

In reference to Claims 56 and 60, Uochi et al. teaches:

- wherein said gate electrode has a heat resistance to a heat treatment of 700°C
(See Figures 1 and 2 and columns 3-6 lines 60-60)

In reference to Claims 57 and 61, Uochi et al. teaches:

- wherein said semiconductor device is one selected from the group consisting of a portable intelligent terminal, a head mounted display, a front-projection type liquid crystal display, a cellular mobile telephone, a portable video camera, and a rear-projection liquid crystal display (See Figures 1 and 2 and columns 3-6 lines 60-60)

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 2, 5, 7, 35, 36, 38-39 are rejected under 35 U.S.C. 103(a) as being obvious over 5,946,560 to Uochi et al. in view of JP 408213317 to Yamazaki et al.

The applied references have a common assignee or inventor, where applicable, with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35

Art Unit: 2813

U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(I)(1) and § 706.02(I)(2).

Claims 1 and 35

Uochi et al. teaches an active layer comprising a semiconductor film comprising silicon (12 or 23); a gate electrode (15 or 25) comprising tantalum adjacent to said active layer with a gate insulating film (14 or 24) interposed between; wherein a concentration of nickel in a source region and a drain region formed in said active layer is higher than a concentration of nickel in other regions in said active layer; wherein a source region and a drain region (16, 18, 26, 28) formed in said active layer comprise a nickel phosphide; a first interlayer insulating film over said active layer and on said gate

Art Unit: 2813

electrode; and a second interlayer insulating film over said first interlayer insulating film.

(See Figures 1 and 2 and columns 3-6 lines 60-60)

Uochi et al. fails to explicitly teach wherein a concentration of nickel in a source region and a drain region formed in said active layer is higher than a concentration of nickel in other regions in said active layer by two or more orders of magnitude.

However, Yamazaki et al., in paragraphs 10-45 of translation and Figures 1-6, teaches a nickel concentration in the source/drain regions that is at least one order of magnitude higher than a concentration of nickel in other regions. Further, Yamazaki et al. teaches that a later processing step reduces the concentration of nickel in the channel by $\frac{1}{2}$ or more. Furthermore, Yamazaki et al. teaches that by lowering the concentration of nickel in the channel, a crystalline stabilized high speed TFT can be obtained. Finally, it is well known within the art that phosphorus acts as a getter for nickel.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to create a channel region with a nickel concentration of two orders of magnitude less than the source/drain regions to design a crystalline stabilized high speed TFT, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233 (CCPA 1955)

Furthermore, the specification contains no disclosure of either the critical nature of the claimed arrangement (i.e. - a channel region with a crystallization promoting material concentration of two orders of magnitude less than the crystallization promoting material in the source/drain regions) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the Applicant must show that the chosen limitations are critical. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990)

Claims 2 and 36

Incorporating all arguments of Claim 1 and noting wherein said nickel phosphide is one of NiP, NiP₂ and Ni₂P. (See Figures 1 and 2 and columns 3-6 lines 60-60)
The Examiner notes that NiP, NiP₂ or Ni₂P is formed during the anneal step of Uochi et al.

Claims 5 and 39

Incorporating all arguments of Claim 1 and noting that Uochi et al. teaches wherein said semiconductor device is one selected from the group consisting of a portable intelligent terminal, a head mounted display, a front-projection type liquid crystal display, a cellular mobile telephone, a portable video camera, and a rear-projection liquid crystal display. (See Figures 1 and 2 and columns 3-6 lines 60-60)

Claims 7 and 38

Incorporating all arguments of Claim 1 and noting that Uochi et al. teaches wherein said gate electrode has a heat resistance to a heat treatment of 700°C. (See Figures 1 and 2 and columns 3-6 lines 60-60)

5. Claims 42, 43, 45-48 and 50-51 are rejected under 35 U.S.C. 103(a) as being obvious over 5,946,560 to Uochi et al. in view of JP 408213317 to Yamazaki et al. in view of 5,426,064 to Zhang et al.

The applied references have a common assignee or inventor, as applicable, with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome

Art Unit: 2813

by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(I)(1) and § 706.02(I)(2).

Claims 42 and 47

Uochi et al. teaches an active layer comprising a semiconductor film comprising silicon (12 or 23); a gate electrode (15 or 25) comprising tantalum adjacent to said active layer with a gate insulating film (14 or 24) interposed between; wherein a concentration of nickel in a source region and a drain region formed in said active layer is higher than a concentration of nickel in other regions in said active layer; wherein a source region and a drain region (16, 18, 26, 28) formed in said active layer comprise a nickel phosphide; a first interlayer insulating film over said active layer and on said gate electrode; and a second interlayer insulating film over said first interlayer insulating film. (See Figures 1 and 2 and columns 3-6 lines 60-60)

Uochi et al. fails to explicitly teach wherein a concentration of nickel in a source region and a drain region formed in said active layer is higher than a concentration of nickel in other regions in said active layer which is less than 5×10^{16} atoms/cm³.

However, Zhang et al., in column 1 lines 52-68, teaches that 1×10^{17} atoms/cm³ of nickel is needed in an amorphous layer to promote crystallization of silicon. The Examiner further notes that JP-408213317 teaches that the concentration of nickel can

Art Unit: 2813

be reduced by $\frac{1}{2}$ or more in the channel and that $\frac{1}{2}$ times 1×10^{17} equals 0.5×10^{17} or 5×10^{16} .

It would have been obvious to one of ordinary skill in the art to modify Uochi et al. by incorporating a channel region with less than 5×10^{16} atoms/cm³ of nickel, as taught by Zhang et al. and JP-408213317, because a channel with a region of 1×10^{17} atoms/cm³ of nickel promotes crystallization of an amorphous layer.

Furthermore, the specification contains no disclosure of either the critical nature of the claimed arrangement (i.e. - a channel region with less than 5×10^{16} atoms/cm³ of crystallization promoting material) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the Applicant must show that the chosen limitations are critical. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990)

Claims 43 and 48

Incorporating all arguments of Claim 1 and noting wherein said nickel phosphide is one of NiP, NiP₂ and Ni₂P. (See Figures 1 and 2 and columns 3-6 lines 60-60)
The Examiner notes that NiP, NiP₂ or Ni₂P is formed during the anneal step of Uochi et al.

Claims 46 and 51

Art Unit: 2813

Incorporating all arguments of Claim 1 and noting that Uochi et al. teaches wherein said semiconductor device is one selected from the group consisting of a portable intelligent terminal, a head mounted display, a front-projection type liquid crystal display, a cellular mobile telephone, a portable video camera, and a rear-projection liquid crystal display. (See Figures 1 and 2 and columns 3-6 lines 60-60)

Claims 45 and 50

Incorporating all arguments of Claim 1 and noting that Uochi et al. teaches wherein said gate electrode has a heat resistance to a heat treatment of 700°C. (See Figures 1 and 2 and columns 3-6 lines 60-60)

6. Claims 40, 41, 52, 53, 74 and 75 are rejected under 35 U.S.C. 103(a) as being obvious over 5,946,560 to Uochi et al. in view of JP 408213317 to Yamazaki et al. in view of 5,426,064 to Zhang et al. in view of 5,764,321 to Koyama et al.

The applied references have a common assignee or inventor, where applicable, with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject

Art Unit: 2813

matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(I)(1) and § 706.02(I)(2).

Claims 40 and 41

Incorporating all arguments of Claim 35 and noting that Uochi et al. and Yamazaki et al. fail to explicitly teach wherein said first insulating layer comprises silicon nitride and wherein said second interlayer insulating film comprises a material selected from the group consisting of acrylics, polyimide, polyamide, polyimideamide and epoxies.

However, Koyama et al., in Figure 3D and column 4 lines 61-68, teaches a laminate structure (311) of silicon nitride and polyimide. Finally, Koyama et al. teaches that this structure (311) acts as an interlayer insulating film.

It would have been obvious to one of ordinary skill in the art to modify Uochi et al. and Yamazaki et al. by incorporating a silicon nitride and polyimide laminate, as taught

Art Unit: 2813

by Koyama et al., to protect the devices formed underneath by providing an interlayer insulating film.

Claims 52 and 53

Incorporating all arguments of Claim 47 and noting that Uochi et al. and Yamazaki et al. fail to explicitly teach wherein said first insulating layer comprises silicon nitride and wherein said second interlayer insulating film comprises a material selected from the group consisting of acrylics, polyimide, polyamide, polyimideamide and epoxies.

However, Koyama et al., in Figure 3D and column 4 lines 61-68, teaches a laminate structure (311) of silicon nitride and polyimide. Finally, Koyama et al. teaches that this structure (311) acts as an interlayer insulating film.

It would have been obvious to one of ordinary skill in the art to modify Uochi et al., Yamazaki et al. and Zhang et al. by incorporating a silicon nitride and polyimide laminate, as taught by Koyama et al., to protect the devices formed underneath by providing an interlayer insulating film.

Claims 74 and 75

Incorporating all arguments of Claim 47 and noting that Uochi et al. fails to explicitly teach wherein said first insulating layer comprises silicon nitride and wherein

Art Unit: 2813

said second interlayer insulating film comprises a material selected from the group consisting of acrylics, polyimide, polyamide, polyimideamide and epoxies.

However, Koyama et al., in Figure 3D and column 4 lines 61-68, teaches a laminate structure (311) of silicon nitride and polyimide. Finally, Koyama et al. teaches that this structure (311) acts as an interlayer insulating film.

It would have been obvious to one of ordinary skill in the art to modify Uochi et al. by incorporating a silicon nitride and polyimide laminate, as taught by Koyama et al., to protect the devices formed underneath by providing an interlayer insulating film.

Response to Arguments

7. Applicant's arguments with respect to claims 1, 35, 42, 47, 54 and 58 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 2003/0134459 to Tanaka et al. teaches wherein ion implanted phosphorus acts as an element for gettering nickel.

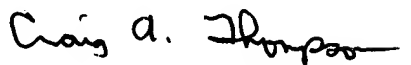
Any inquiry concerning this communication or earlier communications from the examiner should be directed to David L. Hogans whose telephone number is (571) 272-1691. The examiner can normally be reached on M-F (7:30-4:30).

Art Unit: 2813

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


DH


CRAIG A. THOMPSON
PRIMARY EXAMINER